Percutaneous intervention for infrageniculate arterial disease in women may be associated with better outcomes when compared to men

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Objective: **The purpose of this study was to identify any gender-associated differences in the percutaneous treatment of infrageniculate lesions in individuals with chronic critical limb ischemia.**

Methods: **A retrospective chart review was performed on 112 index tibial lesions in 81 consecutive patients operated on from January 2005 to February 2011. All patients were treated for critical limb ischemia—defined as rest pain or tissue loss. Patient demographics, comorbidities, clinical presentation, vascular studies, lesion characteristics, procedures, and postoperative complications were entered into a database for review. Patients were evaluated for primary patency, secondary patency, limb salvage, and mortality rates.**

Results: **Sixty-three index tibial lesions were treated percutaneously in 43 women, compared to 49 lesions in 38 men. There was a trend toward increased cardiac disease (65.8% men vs 44.2% women; $P = .052$) and smoking (52.6% men vs 32.6% women; $P = .070$) in men. Men were more likely than women to have TransAtlantic Inter-Society Consensus (TASC) C and D lesions (83.7% vs 65.1%; $P = .023$) and to be treated for total occlusion (44.9% vs 25.4%; $P = .031$). There were no significant gender-related differences in length of stay or postoperative complications. Women had statistically better primary patency rates than men at 12 and 24 months (77.5% ± 6.9% and 72.9% ± 7.8% in women vs 58.7% ± 9.3% and 45.2% ± 9.9% in men; $P = .032$). Women also had statistically better secondary patency rates than men at 12 and 24 months (90.4% ± 4.8% and 85.1% ± 6.8% in women vs 76.0% ± 8.1% and 58.5% ± 10.8% in men; $P = .028$). Female gender remained an independent predictor of superior patency even after controlling for gender-related differences in TASC grade. There were no significant differences in limb salvage rates at 12 and 24 months (92.1% ± 4.4% and 85.0% ± 7.9% in women vs 88.3% ± 6.4% and 83.4% ± 7.7% in men; $P = .985$). Overall survival rates were similar (59.8% ± 7.6% for women and 68.0% ± 8.1% for men at 24 months; $P = .351$).**

Conclusions: **Percutaneous intervention may be an equally effective or better treatment option for women with chronic limb ischemia and tibial disease when compared to men. In this study, male gender was an independent predictor of poorer primary and secondary patency rates after infrageniculate intervention. There were no differences in postoperative wound complications between genders. Endovascular procedures may lessen the gap in gender-related treatment outcomes and postoperative complications seen after open arterial reconstructions. (J Vasc Surg 2013;57:706-13.)**

Lower extremity peripheral arterial disease (PAD) afflicts 8 million people in the United States and is directly associated with increased functional impairment, increased adverse cardiovascular events, and decreased quality of life.[1] Although PAD was once regarded as a male-dominant disease, recent literature has revealed that the disease is equally prevalent in elderly men and women.[2] Previous studies have shown that women tend to be diagnosed with PAD at a later age and with more advanced disease, and are less likely to have comorbid coronary and cerebrovascular disease.[3-5] Even further, recent studies have shown that women with PAD experience a significantly faster decline in functioning and mobility than men with PAD.[6]

Gender-related differences in the presentation of PAD are also associated with differences in risk factors, management, and outcomes. For example, prior research has suggested that female gender is associated with increased rates of postoperative infection and wound complications after lower extremity open surgical bypass. Historical trials comparing outcomes between genders after open arterial reconstructions have yielded conflicting results when it comes to patency and limb salvage rates.[7-13] However, as vascular interventions evolve and treatment paradigms change, the management of lower extremity PAD, including tibial disease, has moved away from open surgical bypass and toward less invasive procedures that are traditionally associated with decreased wound complications.[14-17] One recent study performed by our group confirmed this trend in women by using state inpatient discharge databases from New York, New Jersey, and Florida. Although women with lower extremity PAD in that study were less likely than their male counterparts to undergo open revascularization, rates of endovascular reintervention were equivalent in men and

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women, increased over time, and were associated with less gender-related differences in mortality and morbidity when compared to open procedures.[18] In another study, the authors specifically examined the role of gender on the immediate and long-term outcomes of percutaneous treatment of infrainguinal occlusive disease; women were found to have equivalent rates of patency, limb salvage, and postoperative complications as men, despite more advanced disease upon presentation.[19] These results have confirmed similar observations made by Abando et al.[20] Nonetheless, there is scarce literature examining the effects of endovascular treatment for infrageniculate disease in women. The purpose of this study was to identify any gender-associated differences in the percutaneous treatment of infrageniculate lesions, specifically relating to demographics, disease presentation, postoperative complications, and treatment outcomes.

METHODS

Study design. From January 2005 to February 2011, 302 consecutive patients undergoing endovascular procedures were included in a prospectively maintained computerized database. Information regarding patient demographics, comorbidities, clinical presentation, vascular studies, lesion characteristics, procedures performed, and postoperative complications were recorded. Follow-up data were also recorded for subsequent hospital, office, and vascular laboratory visits. Only patients requiring treatment for chronic critical limb ischemia (rest pain or tissue loss) were included; patients requiring emergent intervention for acute ischemia were excluded from this study. These data did not incorporate unsuccessful attempts at tibial revascularization. Chronic renal insufficiency was defined as a sustained increase in serum creatinine marked by two separate serum creatinine readings greater than or equal to 1.5 separated by 3 months. Balloon and stent length and diameter were assessed as indicators of vessel length and diameter. In total, 87 procedures were performed for index tibial lesions. This series includes patients undergoing isolated treatment of index tibial lesions as well as those being treated for concurrent femoral or popliteal lesions. Gender differences in outcomes for infrageniculate interventions were assessed.

Methodology. All endovascular procedures were performed by vascular interventionalists using fixed fluoroscopic equipment or a portable imaging fluoroscopic C-arm. The type of procedure performed, which included angioplasty with or without stent placement, was left to the discretion of the interventionalist. Procedures were performed with the patient under local anesthesia with intravenous sedation or under general anesthesia according to the patient's overall condition and the interventionalist's discretion. Selective angiography was performed to localize target lesions and plan necessary interventions. Iodinated contrast was used for most of the patients. Dosage and dilution was tailored according to procedure and the patient's renal status. A few patients received gadolinium before the release of the "black box" warnings relating to nephrogenic systemic fibrosis.

Femoral artery access was gained through an antegrade or retrograde approach. Antegrade punctures were performed with short 4 to 8F sheaths whereas contralateral interventions performed through a retrograde puncture used long 4 to 8F sheaths. Lesions were crossed through the native lumen or subintimally using 0.035, 0.018, or 0.014-inch guidewires in various combinations in conjunction with guide catheters. Subintimal crossing of lesions was used in all total occlusions. Typically, 0.014-inch wires were used to cross tibial lesions. The wires were supported using a 4F or 5F angled Glide catheter (Angiodynamics, Queensbury, NY) or Quick cross catheter (Spectranetics, Colorado Springs, Colo). After sheath placement and before any intervention, patients were routinely heparinized using a bolus of 80 to 100 units/kg of intravenous heparin. The activated clotting time was checked every 30 to 60 minutes. Heparin was re-dosed as needed to maintain an activated clotting time above 300 seconds throughout the procedures.

Balloon angioplasty was performed by inflation of appropriately sized, usually 2 to 4 mm in diameter, long, noncompliant balloons for 60 to 180 seconds at 6 to 15 ATM of pressure with gradual dilatation of the artery up to its normal size as determined by measuring the diameter of the adjacent patent arterial segment. Provisional stenting was used for lesions with >30% residual stenosis, flow-limiting dissections, or for vessel recoil. Completion angiography was performed after all interventions. All patients without contraindications for antiplatelet therapy received aspirin and clopidogrel. For clopidogrel naive patients, 75 mg of clopidogrel was started at least 5 days before a planned procedure or 300 to 450 mg of clopidogrel was given immediately after an intervention. Patients were maintained with 75 mg of clopidogrel daily for 30 days. After 30 days, the need for dual antiplatelet therapy was reassessed. If tolerated, aspirin was continued indefinitely.

Determination of patency. Follow-up for patients undergoing endovascular procedures was routinely performed with duplex ultrasound scan every 3 months postoperatively (eg, 3, 6, 9, and 12 months) for the first year and annually thereafter. The entire length of all tibial vessels was routinely imaged by duplex scans during each follow-up visit. Hospital, office, and vascular laboratory records were reviewed to obtain anatomic follow-up data to determine primary and secondary patency rates. Loss of patency was defined as occlusion or critical stenosis with velocity ratio greater than 2.5:1 (representing a greater than 50% reduction in the lumen diameter) on arterial duplex scan. Computed tomographic angiography and/or digital subtraction angiography were performed to confirm the lesion before reintervention.

Statistical analysis. Demographics, comorbidities, and mortality rates were assessed by patient, patency rates and lesion characteristics were assessed by lesion, and postoperative complications were reported by in-

Table I. Demographics and comorbidities in men and women undergoing percutaneous infra-geniculate interventions

	Women *No. (%)*	*Men* *No. (%)*	P *value*
Total	43	38	
Age (years)	72.53	68.47	.139
Diabetes	29 (67.4)	29 (76.3)	.383
Chronic renal insufficiency	11 (25.6)	8 (21.1)	.636
End-stage renal disease (HD)	10 (23.3)	11 (28.9)	.565
Hypertension	37 (86.0)	32 (84.2)	.819
Cardiac disease	19 (44.2)	25 (65.8)	.052
Chronic obstructive pulmonary disease	6 (14.0)	3 (7.9)	.393
Cancer	6 (14.0)	4 (10.5)	.645
Smoking	14 (32.6)	20 (52.6)	.070

HD, Hemodialysis.

tervention. Kaplan-Meier survival curves were used to analyze patency, limb salvage, and mortality rates, and comparison of Kaplan-Meier curves was performed by log-rank analysis. Univariate analysis of dichotomous variables between genders was performed by Fisher exact *t*-test. Values were expressed as a mean ± SD, where applicable, and significance was assumed for *P* values less than .05. Statistical analysis of the prospectively collected data was performed with SPSS 17.0 software (SPSS, Chicago, Ill).

RESULTS

Patient demographics and comorbidities. From January 2005 to February 2011, a total of 63 index tibial lesions were treated percutaneously in 43 female patients, compared to 49 index tibial lesions in 38 male patients. Demographics and comorbidities are stratified by gender in Table I. In our study, women tended to present for treatment at a later age than men, although this difference did not reach significance (72.53 years in women, 68.47 years in men; $P = .139$). Additionally, men in our study had a trend toward increased prevalence of smoking (52.6% of men vs 32.6% of women; $P = .070$) and cardiac disease (65.8% of men vs 44.2% of women; $P = .052$), although neither of these patterns reached significance.

Presentation, lesion distribution, and treatment modality. Presentation, lesion distribution, and treatment modality are shown in Tables II and III. Generally, men were more likely to be treated for vessel occlusion (vs stenosis) than women (44.9% vs 25.4%; $P = .031$). Additionally, men had statistically more severe TransAtlantic Inter-Society Consensus (TASC)-graded disease, as 83.7% of men had TASC C and D lesions as compared to 65.1% of women ($P = .023$). There were no gender-related differences in lesion diameter (3.05 ± 0.521 mm in women vs 3.00 ± 0.479 mm in men; $P = .735$) or lesion length (68.81 ± 65.38 mm in women vs 64.30 ± 63.48 ± in men; $P = .773$). There were no gender-related differences in preoperative ankle-brachial indexes (0.83 ± 0.497 in women vs 0.76 ± 0.470 in men; $P = .722$) or postoperative ankle-brachial indexes (0.93 ± 0.359 in women vs 0.89 ± 0.264 in men; $P = .792$). All men and women were treated for either rest pain or tissue loss and were grouped according to the Fontaine classification for chronic limb ischemia, which revealed no gender-related differences. Of the infra-geniculate procedures performed in women, 34.8% were

Table II. Presentation and lesion severity in primary interventions in men and women

	Women *No. (%)*	*Men* *No. (%)*	P *value*
Fontaine classification			
Stage 3	12 (26.1)	10 (24.4)	.856
Stage 4	34 (73.9)	31 (75.6)	
TASC I classification			
TASC A and B	22 (35.0)	8 (16.3)	**.023**
TASC C and D	41 (65.1)	41 (83.7)	
Lesion			
Occlusion	16 (25.4)	22 (44.9)	**.031**
Stenosis	47 (74.6)	27 (55.1)	

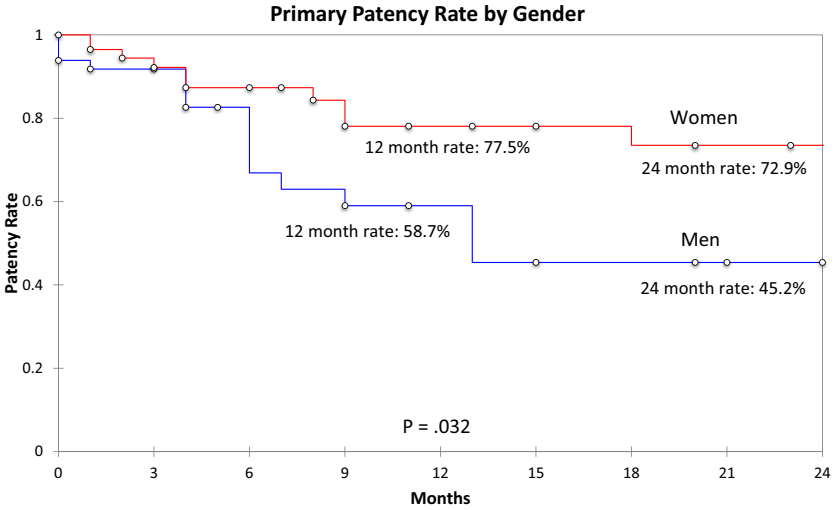
TASC, TransAtlantic Inter-Society Consensus.
The boldface numbers represent statistical significance ($P < .05$).

Table III. Lesion distribution and treatment modality

	Women *No. (%)*	*Men* *No. (%)*	P *value*
Regions treated			
Tibial only	16 (34.8)	14 (34.1)	.418
Tibial and femoral	3 (6.5)	3 (7.3)	
Tibial and popliteal	3 (6.5)	8 (19.5)	
Tibial and femoral and popliteal	22 (47.8)	14 (34.1)	
Other	2 (4.3)	2 (4.9)	
Tibial vessels treated			
Posterior tibial	7 (11.1)	14 (28.6)	.119
Tibioperoneal trunk	16 (25.4)	10 (20.4)	
Anterior tibial	26 (41.3)	18 (36.7)	
Peroneal	14 (22.2)	7 (14.3)	
Treatment modality			
Angioplasty alone	46 (73.0)	38 (77.6)	.621
Angioplasty with stenting	16 (25.4)	11 (22.4)	
Atherectomy	1 (1.6)	0 (0)	

Table IV. Postoperative complications

	Women *No. (%)*	*Men* *No. (%)*	P *value*
Hematoma requiring intervention	1 (2.2)	2 (4.9)	.496
Pseudoaneurysm	3 (6.5)	2 (4.9)	.746
Thrombosis	1 (2.2)	0 (0.0)	.348
Acute cardiac event	0 (0.0)	0 (0.0)	1
Return to operating room within 30 days	2 (4.3)	5 (12.2)	.196
Death within 30 days	0 (0.0)	1 (2.4)	.323



At Risk	0 mos	3 mos	6 mos	9 mos	12 mos	15 mos	18 mos	21 mos	24 mos
F	63	42	32	23	19	17	16	14	12
M	49	32	18	15	13	9	9	8	6

Fig 1. Primary patency rates for infrageniculate interventions in men and women by Kaplan-Meier analysis. Twelve- and 24-month primary patency rates for women were 77.5% ± 6.9% and 72.9% ± 7.8%, compared with 58.7% ± 9.3% and 45.2% ± 9.9% in men ($P = .032$).

for isolated tibial lesions whereas the remaining 65.2% were for tibial and concurrent iliac, femoral, or popliteal disease. These rates were similar to those in men (34.1% with isolated tibial lesions, 65.9% with tibial and concurrent iliac, femoral, or popliteal disease; $P = .418$). There were 22 women (47.8% of all lesions) and 14 men (34.1% of lesions) that had concomitant femoropopliteal interventions, with no significant difference between genders (Table III). There were no significant differences between genders in the particular tibial vessels that were treated. Treatment modalities were also consistent between genders, as rates of angioplasty alone vs angioplasty with stenting vs atherectomy were similar in men and women.

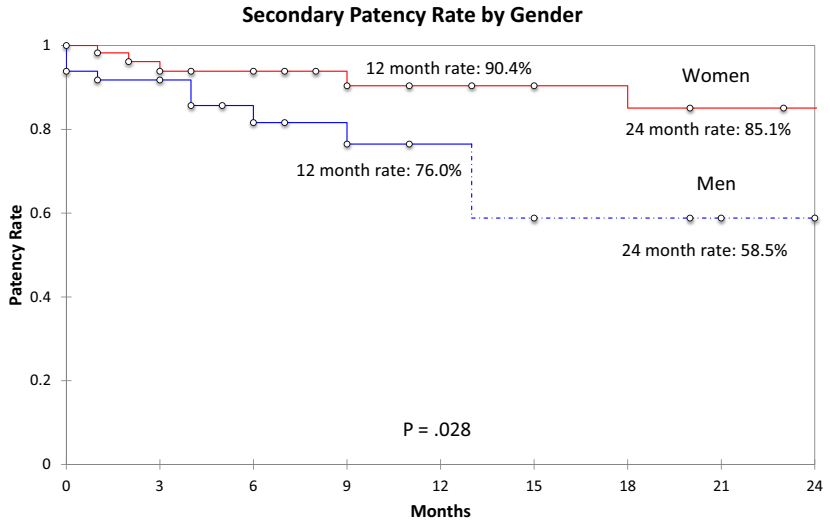
Outcomes. Patients were reviewed for postoperative development of hematoma requiring intervention, pseudoaneurysm, access site thrombosis, acute cardiac event, and death. Acute cardiac event was defined as the postoperative development of one or more of the following: myocardial infarction, electrocardiographic changes, new arrhythmia, or congestive heart failure. Two men developed hematomata requiring reintervention, whereas one woman developed this complication (4.9% vs 2.2%; $P = .496$). In the study, there was one patient death in the perioperative period due to a retroperitoneal hematoma, leading to a 30-day mortality of 2.4% for men and 0% for women ($P = .324$). All other complication rates, including return to operating room within 30 days and length of stay, were not significantly different between genders as shown in Table IV.

Mean and median follow-up time for all lesions was 13.08 and 7.4 months, respectively, with SD and range of 14.78 and 70 months, respectively. Duplex scan follow-up was performed at 3, 6, 9, and 12 months and compliance rates were 76.8%, 64.3%, 53.6%, and 48.2%, respectively. The 12- and 24-month primary patency rates for women were 77.5% ± 6.9% and 72.9% ± 7.8%, compared with 58.7% ± 9.3% and 45.2% ± 9.9% in men. This difference was found to be statistically significant when analyzed by log-rank analysis of Kaplan-Meier distributions, as shown in Fig 1 ($P = .032$). Gender remained an independent predictor of primary patency rate even after TASC grade differences were accounted for using Cox proportional hazards model with gender and TASC grade as covariates (Table V). The 12- and 24-month secondary patency rates for women were 90.4% ± 4.8% and 85.1% ± 6.8%, com-

Table V. Cox proportional hazard analysis evaluating independent predictors of primary and secondary patency loss

	HR	*95% CI*	P *value*
Predictors of primary patency failure			
Gender	0.395	0.175-0.891	**.025**
TASC A and B vs TASC C and D	0.611	0.257-1.452	.265
Predictors of secondary patency failure			
Gender	0.291	0.098-0.862	**.026**
TASC A and B vs TASC C and D	1.788	0.595-5.373	.300

CI, Confidence interval; *HR,* hazard ratio; *TASC,* TransAtlantic Inter-Society Consensus.
The boldface numbers represent statistical significance ($P < .05$).



At Risk	0 mos	3 mos	6 mos	9 mos	12 mos	15 mos	18 mos	21 mos	24 mos
F	63	45	36	31	28	21	20	20	19
M	49	36	27	23	21	16	14	12	9

Fig 2. Secondary patency rates for infrageniculate interventions were significantly higher in women than in men. Twelve- and 24-month secondary patency rates for women were 90.4% ± 4.8% and 85.1% ± 6.8%, compared with 76.0% ± 8.1% and 58.5% ± 10.8% in men ($P = .028$). *Broken line* indicates when standard error exceeds 10%.

Table VI. Rates of repeat intervention

	Women No. (%)	*Men No. (%)*	P *value*
1 repeat intervention	6 (9.5)	6 (12.2)	.648
2 repeat interventions	3 (4.8)	6 (12.2)	.174
3 repeat interventions	1 (1.6)	0 (0.0)	.380
Bypass	0 (0.0)	4 (8.2)	**.044**
Amputation	4 (6.3)	7 (14.3)	.184

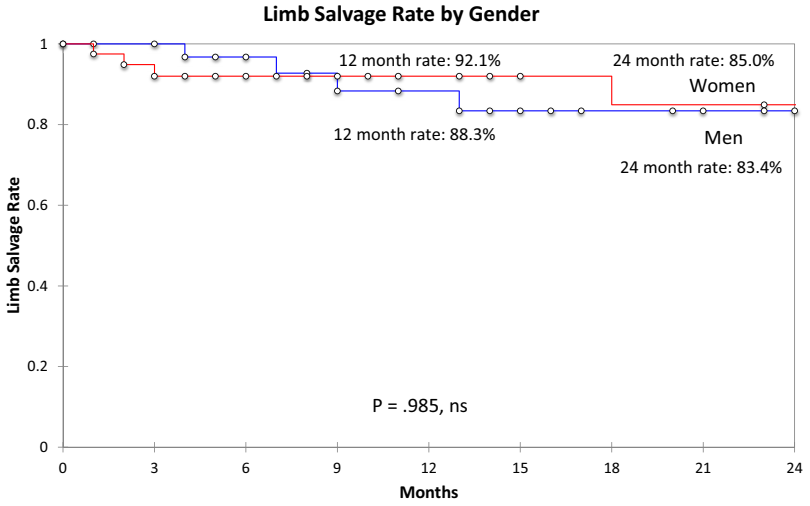
The boldface number represents statistical significance ($P < .05$).

pared with 76.0% ± 8.1% and 58.5% ± 10.8% in men. This difference was also statistically significant as demonstrated in Fig 2 ($P = .028$), and gender remained an independent predictor of secondary patency rate even after TASC grade was controlled (Table V). The number of repeat interventions did not differ significantly between genders (Table VI). However, four men underwent open surgical revascularization compared to zero women ($P = .044$). Limb-salvage rates were not significantly different between genders (92.1% ± 4.4% in women vs 88.3% ± 6.4% in men at 12 months and 85.0% ± 7.9% in women vs 83.4% ± 7.7% in men at 24 months), as shown in Fig 3 ($P = .985$). Log-rank analysis of Kaplan-Meier curves did not show significant differences in rates of overall survival at 24 months between genders (59.8% ± 7.6% for women and 68.0% ± 8.1% for men), as shown in Fig 4 ($P = .351$).

DISCUSSION

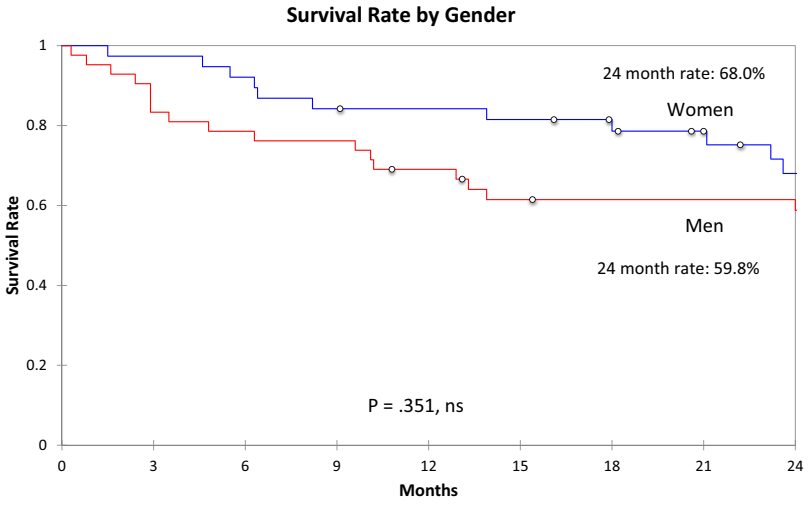
The United States is positioned to see a rise in the average age of its population over the next 40 to 50 years, particularly due to the aging of the "baby-boomers." Because lower extremity occlusive disease primarily afflicts elderly populations, careful assessment of treatment modalities for this debilitating disease will only become more important in the coming years. Many sociologic and epidemiologic studies have also documented that the majority of the growing elderly population will be comprised of women (http://www.prcdc.org). Historically, there has been a misconception that lower extremity occlusive arterial disease does not affect women to the same extent as men. These theories have some basis, as various reproductive and metabolic factors help to maintain an atheroprotective environment that may account for the delayed onset of arterial disease seen in women.[21-23] However, it has also been established that once menopause occurs, this atheroprotective environment disappears. Emerging evidence from multiple studies now suggests that the incidence of arterial occlusive disease becomes equal between genders during the sixth and seventh decades of life, and some surveys even report higher rates of lower extremity occlusive disease in women compared to men.[24-27]

Women who are screened for PAD also tend to present with more asymptomatic disease than men, which may contribute toward an older age at treatment.[28] However, when women do seek treatment, they present with significantly more advanced disease than men—a finding that has been confirmed by our group's recent studies on gender-related differences in lower extremity occlusive disease.[4,19] One hypothesis for this pattern is that when women do present to physicians with symptoms akin to lower extremity occlusive disease, they can often be misattributed to



At Risk	0 mos	3 mos	6 mos	9 mos	12 mos	15 mos	18 mos	21 mos	24 mos
F	46	33	26	21	18	14	13	12	12
M	41	30	25	21	18	15	13	12	9

Fig 3. Limb salvage rates were 92.1% ± 4.4% in women vs 88.3% ± 6.4% in men at 12 months and 85.0% ± 7.9% in women vs 83.4% ± 7.7% in men at 24 months; these did not differ significantly ($P = .985$).



At Risk	0 mos	3 mos	6 mos	9 mos	12 mos	15 mos	18 mos	21 mos	24 mos
F	43	36	34	33	29	25	24	24	23
M	38	37	35	32	31	30	27	23	19

Fig 4. Survival rates were equivalent between genders ($P = .351$). Twenty-four month survival rates were 68.0% ± 8.1% and 59.8% ± 7.6% in men and women, respectively.

osteoporosis or arthritis—problems commonly found in this population.[29,30] Another possible explanation is that elderly women tend to be more socially isolated and have lower income than men, thus making them less likely to seek medical care.[31]

To our knowledge, this study is the first of its kind to purely investigate the gender-related differences in endovascular treatment of infrageniculate disease. Our findings suggest that women perform significantly better than men with regard to primary and secondary patency rates after infrageniculate endovascular interventions. Although male patients in this study initially presented with more anatomically challenging disease, male gender remained an independent predictor of poorer primary and secondary patency rates even after TASC grade was controlled. A recent study by Gallagher et al[32] on gender differences in the endovascular treatment of infrainguinal PAD has demonstrated findings similar to this study. In their retrospective study,

Gallagher et al[32] found that in patients with chronic limb ischemia receiving percutaneous transluminal angioplasty (PTA) for tibial disease, women had superior primary and secondary patency rates at all time points when compared to men. In their study, there were no differences between genders with respect to lesion length, diameter, or TASC classification. Their patency findings are consistent with those of our current study, which includes both patients undergoing PTA only and those undergoing PTA + stenting.

Although this study is the first to purely investigate the role of gender on outcomes after infrageniculate endovascular interventions, there exist a number of general studies on tibial percutaneous interventions that include basic comparisons between genders. In contrast to our current study, the majority of these small, retrospective studies have shown no gender differences in long-term outcomes after either tibial PTA or cases of primary tibial stenting in their analyses.[16,17,33] Additionally, a meta-analysis conducted by Romiti et al[34] on the use of infrapopliteal angioplasty to treat chronic critical limb ischemia in 30 studies found that gender was not a significant predictor of patency or limb-salvage rates. A notable finding from review of these studies was a pattern of inferior patency rates compared to those in our study (12-month primary patency of 58.1% ± 4.6% reported by Romiti et al[34] vs 69.7% ± 5.6% in our study and 12-month secondary patency of 68.2% ± 5.9% reported by Romiti et al[34] vs 84.1% ± 4.5% in our study). The reasons for this difference are unclear. As suggested by others, there is significant variability in techniques applied among the literature, which may account for the variability seen in outcomes. Additionally, as techniques improve over time, reported results are expected to be better.[17]

Although most of the existing literature on infrageniculate endovascular repair has shown equivalent gender outcomes, the evidence is less clear for lower extremity open repair. Many studies have demonstrated conflicting results in patency and limb-salvage rates between genders after open revascularization procedures.[9-13] Despite this conflicting data, one consistent finding in the literature is that women undergoing open revascularization experience an increased frequency of wound complications. Furthermore, female gender remains an independent risk factor for postoperative wound and infectious complications even when results are controlled for concomitant comorbidities. Reasons for this discrepancy are not well understood but could include differences between men and women in metabolism, fat content, and fat distribution (particularly in the upper thighs).

Endovascular repair may thus be a reasonable therapeutic alternative that can minimize such complications in women. In this current gender-focused analysis of patients undergoing primary tibial interventions, there were no differences between genders in periprocedural mortality rates and wound complications. This finding is consistent with a study conducted by our group in 2010 that examined risk factors for PAD and outcomes after open or endovascular lower extremity arterial reconstructions (using a large discharge database from the three most populous US states providing gender data). In that report, women had significantly higher mortality and periprocedural complications when compared to men undergoing open reconstructions; however, the gender-related discrepancy was notably diminished after endovascular procedures.[19]

There are some notable differences between this current gender analysis of percutaneous infrageniculate interventions and our group's previous gender study on percutaneous infrainguinal interventions. For one, in our previous report, women undergoing infrainguinal interventions were older than men.[20] This age difference was not statistically significant in our current analysis, which dealt only with patients with more advanced (tibial) disease. Furthermore, our previous report showed that although patency and limb salvage rates were similar in both genders, women required more reinterventions to maintain the same secondary patency rate. In the current study, this difference dissipated as well.

There are certain limitations to this study; namely, the retrospective nature of the study and the relatively small number of patients included in the study. Short follow-up time is also a potential limitation of this study. Nonetheless, this the only existing study that is focused specifically on gender-related differences in infrageniculate interventions and provides an analytical comparison of complications and outcomes between men and women.

CONCLUSIONS

Percutaneous intervention may be an equally effective or better treatment option in women with chronic limb ischemia and tibial disease when compared to men. Women in our study had superior primary and secondary patency rates when compared to men after endovascular treatment of infrapopliteal lesions, in addition to equivalent postoperative complication rates. Although larger studies with longer follow-up times are required to further investigate this treatment modality, our findings, in conjunction with those of previous articles, support the view that endovascular treatment may lessen the gap in gender-related treatment outcomes and postoperative complications observed in patients undergoing open arterial reconstructions.

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AUTHOR CONTRIBUTIONS

Conception and design: AT, VT, MM, PF, AV
Analysis and interpretation: AT, DH, RT, CS, AV
Data collection: AT, CS
Writing the article: AT, DH, RT, AV
Critical revision of the article: AT, DH, RT, CS, VT, MM, PF, AV
Final approval of the article: AT, DH, RT, CS, VT, MM, PF, AV
Statistical analysis: AT, DH, CS

Obtained funding: MM, PF
Overall responsibility: AV

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